Hot and Cold Water Mixing: Flows for a Target Temperature

Hot and cold water flows needed to deliver a mixed flow at a target temperature, the hot water share and the heat the heater must supply to make the hot water.

Method: Mixing energy balance

Input parameters

Unit system: SI

Parameter	Value	Unit
Mixed flow required	12.000	L/min
Target mixed temperature	40.000	°C
Hot water temperature	60.000	°C
Cold water temperature	15.000	°C

Calculated results

Parameter	Value	Unit
Hot water share	55.556	%
Hot water flow	6.6667	L/min
Cold water flow	5.3333	L/min
Heater power to make the hot water from cold	20.733	kW

Notes for this case

• An energy balance on the mixing valve, with constant specific heat and density, gives the hot share x = (T_m − T_c)/(T_h − T_c). The heater must raise that hot flow from the cold supply temperature: P = ρc_pV̇_h(T_h − T_c), with ρ ≈ 992 kg/m³ and c_p ≈ 4.18 kJ/kg·K. Showers use about 38–41 °C; thermostatic mixing valves deliver it safely from stored water at 60 °C or more, which is needed against Legionella.

Formula and method

$$x_h = \frac{T_m - T_c}{T_h - T_c}, \quad P_h = \rho c_p \dot{V}_h (T_h - T_c)$$

Variables

$\dot{V}$	Mixed flow required	m³/s
T_m	Target mixed temperature	K
T_h	Hot water temperature	K
T_c	Cold water temperature	K
x_h	Hot water share	-
$\dot{V}_h$	Hot water flow	m³/s
$\dot{V}_c$	Cold water flow	m³/s
P_h	Heater power to make the hot water from cold	W

Method and standards

Water mixing.

Assumptions and limits

- Constant properties; adiabatic mixing.

References

Mixing energy balance

Report details

Report reference	FCC-HE3G-31XN (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/hvac/chillers/hot-cold-water-mixing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.